Space Weather Forecast

Issued on Thursday, 11 May 2023 at 13:29 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1-G2 Minor/Moderate geomagnetic storm conditions expected on Days 1 and 2 (11-12 May), with a chance of G3/Strong storms as Earth sees an expected CME (Coronal Mass Ejection) arrival. S1/Minor Solar Radiation Storm easing. Further R1/R2 Minor/Moderate radio blackouts expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate over the past 24 hours, with a Moderate flare observed at 10/1421UTC, originating from a large and magnetically complex sunspot region in the northwest quadrant, and another observed at 11/0901UTC from a region in the southwest. The complex region in the northwest has produced several Moderate-class flares over recent days, including the Moderate flare late on the 9th May, which subsequently produced a large Coronal Mass Ejection (CME) observed in coronagraph imagery. This has been analysed and is considered to be Earth-directed, with a likely arrival on Day 1 (11 May), probably late in the day. No other significant Earth-directed have been observed.

Solar Wind / Geomagnetic Activity: The solar wind has been at Elevated to Strong levels, steadily reducing from a peak speed of around 680km/s observed at 10/1310UTC. The Interplanetary Magnetic Field (IMF) strength was Moderate at the start of the period, before declining to the current weak levels, with the all-important north-south component varying weakly. The resultant geomagnetic activity was generally Quiet to Unsettled (Kp2-3), but with a G1/Minor Storm (Kp5) interval observed at 10/1200-1500UTC.

Energetic Particles / Solar Radiation: Solar radiation declined below the S1 Minor Solar Radiation Strong threshold over the past 24 hours, with a peak of 83pfu at 10/1250UTC and a steady decline, falling below threshold at 11/0400UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to High activity is likely to continue, with further M-flares likely and a slight chance of isolated X-class flares.

Solar Wind / Geomagnetic Activity: A large CME was observed in coronagraph imagery late on the 9th May, which was associated with Moderate flare originating from the largest and most magnetically complex sunspot in the northwest quadrant. The CME has been analysed and modelled, which suggests an arrival at Earth on Day 1 (11 May), most likely arriving later in the day (1500-2100 UTC), although there remains some uncertainty. CME effects expected to continue into Day 2, gradually easing into Day 3.

Geomagnetic activity is expected to be Quiet initially, before increasing to Unsettled or Active (Kp3-4) levels with the expected arrival of the CME from the 09 May. G1-G2/Minor-Moderate Storms expected late on Day 1 (11 May) and into Day 2 (12 May), with G3/Strong Storm intervals now viewed as an increased chance. Into Days 3 and 4 (13-14 May) geomagnetic

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activity expected to reduce to Quiet to Unsettled levels pending any further CME influence, with Active intervals likely and a reducing chance of G1-G2/Minor-Moderate Storms.

Energetic Particles / Solar Radiation: Solar radiation levels are likely to gradually decline to background levels during the coming days, though the risk remains for further enhancement, mainly due to the chance of significant flares from the largest sunspots in the northwest and the onset of the CME arrival on Day 1 (11 May), with effects potentially lingering into the forecast period.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	Yes	90	80	20	10
Strong	**G3**	No	50	30	5	1
Severe	**G4**	No	15	10	1	1
Extreme	**G5**	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**R1-R2 M Class**	Yes	70	70	60	50
Very Active	**R3 to R5 X**	No	20	20	15	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	Yes	50	30	20	20
Very Active	**≥ S3 ***	No	5	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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